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VIDEO INPUT SWITCHING AND SIGNAL PROCESSING APPARATUS

Field of the Invention

This invention generally relates to video equipment, and more particularly, to a converter arrangement operative to configure a plurality of input
5 sources into an integrated operating environment.

Background of the Invention

Television viewers are often faced with complicated wiring requirements for integrating the various signal sources into their systems. This situation was made
10 worse in part by the Federal Cable Regulation Act of 1992, which caused some cable systems to discontinue carriage of local Broadcast stations that insist on receiving a per-subscriber fee to allow retransmission of their signals. As a result, cable subscribers on these systems must
15 provide their own antennas in order to receive signals from these broadcast stations.

With the availability of signals from direct-broadcast satellites, many consumers will consequently have three different signal sources to choose from when viewing,
20 with the added confusion that all three of these sources may provide channels with the same numerical designation. A further complication is the integration of cable converters with the public switched telephone network, for billing special event programming and various other pay-
25 per-view schemes.

The invention comprises an apparatus for integration of a plurality of television signal sources into a single system. Internal provisions include a standard broadcast-frequency tuner as well as a cable tuner. The cable tuner may optionally include provisions for a descrambler module for premium or pay-per-view services, which may be implemented either as an internal circuit board, an internal plug-in module, or an external plug-in unit. A third input is provided as a direct-broadcast-satellite tuner, which itself may be implemented as an internal circuit board or as an internal or external plug-in unit. As is the case for the cable tuner, provisions are included for a separate descrambler unit implemented as an internal circuit board or as an internal or external plug-in unit. As a further option, additional inputs may be provided for other uses, such as VCR playback signals. Outputs are provided both for baseband audio and video, and also through an RF modulator.

A system controller, which accepts control signals from a standard infrared-type hand-held remote-controller, handles such tasks as input selection and channel switching, and allows the user to reassign channel designations at will, even including input switching as part of the channel selection. The controller also integrates signals for an optional telephone interface, for pay-per-view billing or other uses. When required, the controller is further capable of enabling descrambling circuitry as appropriate for each signal source. In like manner, specialized modules (as, for example, MPEG decoders

and the like) may be enabled or have their operating parameters configured so as to process digitally encoded signals. In a preferred embodiment, the unit may be provided with additional tuner provisions associated with any of the various inputs, for receiving signals in which a primary signal is on one channel, and a secondary signal is on a different channel, as, for example, in the case of a stereoscopic broadcast system in which one channel carried the "left eye" signal, and a second channel carried the "right-eye" signal.

Brief Description of the Drawings

FIGURE 1 is a block diagram which illustrates the main features of the invention; and

FIGURE 2 is a block diagram which shows signal separation and recombination means associated with providing supplemental program information.

Detailed Description of the Preferred Embodiment

The invention is explained by way of reference to Figure 1, which shows the main features of a system having input switching provisions. Broadcast-frequency signals 2 from a standard antenna are received at the broadcast tuner 4. These signals are demodulated into baseband audio and video signals, which then are provided to the audio/video switching matrix 22. Cable system signals 6 are provided to the cable tuner 8, which as an option may include a descrambler module 10; this may be implemented either as an internal circuit board, an internal plug-in module, or an external plug-in unit, and this unit would be compatible

with the scrambling system used on the particular cable system. Depending upon the circumstances, one or more of the various tuners may interface to a decoder to receive other specialized information such as teletext or closed-captioning, though not referenced in the figures.

Optional satellite-receiver signals 12 are provided to the satellite tuner 14, which, like the cable tuner, also may include an optional descrambler unit 16, implemented through a similar range of methods as described above for the cable tuner. In some installations, the satellite receiver service would include its own tuner and/or descrambler means, in which case the signals would be input to the cable converter through one of several direct-connection inputs (not shown); these inputs would also allow for the integration of other sources, such as VCR playback signals. All of these input sources are demodulated and provided to the audio/video switching matrix as baseband audio and video signals, enabling signal routing within the audio/video switching matrix to be implemented as a baseband video "bus." The selected signal from the switching matrix is provided at the output 24; these signals are also optionally provided to an RF modulator 26, for output as modulated signals 28.

In the preferred embodiment, the system provides for the association of one channel with one or more other channels carrying supplemental information. For example, one channel might carry the "left-eye" view of a stereoscopic signal, while a second channel carried the "right-eye" view. Such additional channels may alternatively provide the following types of supplemental

information, though the entire range of available information is by no means limited to this list:

- picture enhancement information (as suggested by several of the proposed HDTV systems) to provide wide-screen or other effects;
- video-game related information, including information related to additional players;
- digital data, such as statistical information about players in a sporting event or pricing/account information associated with a shopping channel;
- additional audio information, including information which provides higher fidelity, stereophonic/surround-sound effects, foreign language audio, "sing-along" lyrics to accompany a popular music concert, etc.
- teletext or closed-captioning information.

In this embodiment of the invention, a primary channel will typically carry "primary" program information along with additional information used by the system for directing a second tuner to a secondary channel; other channels could be similarly associated. The information relating a primary channel to one or more secondary channels carrying supplemental information may be derived in various ways. For example, the primary channel may carry a pointer to the additional channel(s), for example, in a subcarrier, or as part of synchronization as during vertical retrace. Such a pointer may be carried more or less continuously by the primary channel, or may be

broadcast more infrequently, for example, at the start of a program. As an aid in the scrambling and/or encryption of a program, information relating the programs may be downloaded and locally stored on an authorized basis. As
5 a further measure, a "channel-hopping" scheme may be used, wherein different related channels are used at different times, with only authorized viewers being provided with the overall plan.

As an alternative to the broadcasting of
10 information relating channels, codes may be published in a format similar to the currently available VCR Plus system now in use for VCR programming. That is, in addition to a code which contains start/stop times and a single channel number, the same or a different code may also contain
15 multiple channels designations, certain of which provide the supplementary information. As in the current implementation of VCR Plus, such code may be entered in the system's hand-held remote control for reception by the receiver 30 depicted in Figure 1. Other means for
20 receiving and storing these codes are also possible, including downloading from a personal computer, and so forth. Regardless of the technique used to derive the additional programming information, on-screen programming techniques may be used to enable a user to program in the
25 information so as to label it, for example, to designate a particular channel of the decoder to identify the station call letters or to provide more descriptive information.

As shown in Figure 2, these features may be implemented with a signal separator 52, feeding primary and
30 secondary signals to individual tuners 54A and 54B

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controller. For example, the user may choose to assign cable converter channels 1, 2, and 3 to broadcast channels 2, 4, and 7; the user might choose to assign cable converter channel 4 to cable system channel 40, and cable
5 converter channel 5 to direct-broadcast satellite channel 15. In this way, the user is able to select any channel line-up desired, including the channels selected from all sources available in any order, and with any channel numerical designation. Although not shown, it is to be
10 understood that system controller 32 interfaces to an appropriate memory device for storing these channel assignments, including the user-defined designations.

In an alternative embodiment, optional MPEG decoders or other digital signal processors (not shown) may
15 be enabled and/or have their operating parameters configured under control of the system controller, using a similar modular approach to that described herein above with reference to descrambler modules.

What is claimed is: